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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/706,799	11/12/2003	Joel S. Karp	UPN-4296	7178

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EXAMINER

SUNG, CHRISTINE

ART UNIT	PAPER NUMBER
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2884

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08/27/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/706,799

Applicant(s)

KARP ET AL.

Examiner

Christine Sung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 6-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 6-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

1. The amendment filed on June 4, 2007 has been accepted and entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-3, 6-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Loef (*High -Energy Resolution Scintillator: Ce+3 Activated LaBr₃*) in view of Young (US Patent 4,980,552 A).

Regarding claims 1-2, Van Loef discloses a detector (column 2, paragraphs 1-2) comprising:

A scintillator comprising a crystal (column 2, paragraph 1), the scintillator having a decay time constant $\tau \leq 35$ ns (see table 1, data for LaBr₃ or LaCl₃) and a light output at least equal to the light output of NaI (Tl) (see table 1, data for LaBr₃ or LaCl₃) and

A photomultiplier (column 2, paragraph 2). Van Loef further teaches that the scintillator has applications in medical imaging, gamma ray spectroscopy, etc. (column 1, paragraph 1). Further Van Loef discloses that this scintillator is ideal for medical imaging and gamma ray spectroscopy because of its high light output and very fast decay time (column 1, paragraph 4).

Van Loef does not disclose using a plurality of the detector devices and further does not disclose the conventional PET detector positioning, where the plurality of crystals and PMTs are placed around the periphery of the cavity where a patient is accepted. Further, Van Loef does not explicitly state the conventional positioning of the scintillator crystals with respect to the PMT. However, Young discloses the conventional PET detector (figure 1) where a plurality of scintillator crystals (Figure 3, element 22) and a plurality of PMTs (element 24) are arranged respectively around a cavity for accepting a patient (see figure 1). Further, Young discloses a plurality of PMTs (Figure 3, element 24) arranged with respect to the plurality of scintillator crystal (element 22) wherein each PMT receives light output from several of the scintillator crystals (see figure 3, there are more crystals than PMTs, thus each PMT receives light output from several scintillator crystals).

One of ordinary skill in the art, at the time the invention was made, would be motivated to take the medical imaging/ gamma spectroscopy detector disclosed by Van Loef and place them in the conventional PET configuration and PMT/scintillating configuration as disclosed by Young in order to increase detection efficiency and increase spatial resolution. The configuration as disclosed by Young increases spatial resolution because of the smaller area the light from each discrete crystals are detects.

Regarding claim 3, Van Loef discloses a detector (column 2, paragraphs 1-2) comprising:

A scintillator comprising a crystal (column 2, paragraph 1), the scintillator having a decay time constant $\tau \leq 35$ ns (see table 1, data for LaBr₃ or LaCl₃) and a light output at least equal to the light output of NaI (Tl) (see table 1, data for LaBr₃ or LaCl₃) and

A photomultiplier (column 2, paragraph 2). Van Loef further teaches that the scintillator has applications in medical imaging, gamma ray spectroscopy, etc. (column 1, paragraph 1). Further Van Loef discloses that this scintillator is ideal for medical imaging and gamma ray spectroscopy because of its high light output and very fast decay time (column 1, paragraph 4).

Van Loef does not disclose using a plurality of the detector devices and further does not disclose the conventional PET detector positioning, where the plurality of crystals and PMTs are placed around the periphery of the cavity where a patient is accepted. Further, Van Loef does not explicitly state the conventional positioning of the scintillator crystals with respect to the PMT. However, Young discloses the conventional PET detector (figure 1) where a plurality of scintillator crystals (Figure 3, element 22) and a plurality of PMTs (element 24) are arranged respectively around a cavity for accepting a patient (see figure 1). Further, Young discloses a plurality of PMTs (Figure 3, element 24) arranged with respect to the plurality of scintillator crystal (element 22) wherein each PMT receives light output from several of the scintillator crystals (see figure 3, there are more crystals than PMTs, thus each PMT receives light output from several scintillator crystals). Further, Young discloses a time stamp circuit (Figure 2, element 50) that records the time of receipt of gamma rays by respective PET detectors and provides timing data outputs; and a processor (element 50) that receives said timing data outputs, calculates TOF of gamma rays through a patient in the cavity and uses TOF of gamma rays in the reconstruction (element 80) of the images of the patient.

One of ordinary skill in the art, at the time the invention was made, would be motivated to take the medical imaging/ gamma spectroscopy detector disclosed by Van Loef and place them in the conventional PET configuration and PMT/scintillating configuration as disclosed by Young in order to increase detection efficiency and increase spatial resolution. The configuration as disclosed by Young increases spatial resolution because of the smaller area the light from each discrete crystals are detects.

Regarding claims 6-7, Van Loef discloses that the scintillator crystal has dimensions of $3 \times 10 \text{ mm}^3$ (Column 2, paragraph 1), and states that the crystal was cut from a larger crystal. Although Van Loef and Young do not disclose the exact dimensions, one of ordinary skill in the art would be motivated to cut the crystals from the stock crystal as claimed in order to increase the stopping power (i.e. increase the scintillator thickness) or increase the spatial resolution by decreasing the individual crystal size, but increasing the number of crystals.

Regarding claim 9, Young discloses that the detector modules are arranged in a cylindrical configuration about the cavity (see figure 1).

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Van Loef (*High - Energy Resolution Scintillator: Ce+3 Activated LaBr₃*) in view of Young (US Patent 4,980,552 A) further in view of Cherry (US Patent 6,552,348 B2).

Regarding claim 8, Van Loef in view of Young discloses the limitations set forth in claim 1, but does not specify the use of a light guide between the PMT and the scintillator crystals for optical coupling. However, such a configuration is known in PET/gamma detector systems as disclosed by Cherry (figure 1B, element 12 = light guide). One of ordinary skill in

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the art would be motivated use a light guide between the PMT and the scintillator in a PET detector in order to increase detection efficiency and spatial resolutions (see abstract).

Response to Arguments

6. Applicant's arguments filed on June 4, 2007 have been fully considered but they are not persuasive. Note: Applicant does not make arguments specific to a particular claim, or claim limitation, thus the response to arguments made below are a good faith effort by the examiner to address all arguments.

7. First, applicant argues that the Van Loef reference only discloses application of LaBr to PET but not to TOF PET. The examiner respectfully disagrees. Even if the Van Loef reference does not specify the particular TOF-PET application, TOF-PET are specific types of general PETs as it would have been obvious to one skilled in the art of PET detectors to properly adapt improvements in general PETs for TOF-PET applications.

8. Second, applicant argues it would not have been obvious to have a PET scanner with many crystals in a ring with PMTs and light guides with LaBr₃ or LaCl₃ crystals because it would lead to poor timing resolution needed for TOF. However, timing resolution, spatial resolution, imaging size, among other factors, are all considered when constructing TOF-PET or general PET detectors. Applicant's argument regarding poorer timing resolution is not persuasive because it is well-known that such a factor is important for proper TOF-PET detection. Thus it would have been obvious to one having ordinary skill in the art at the time the invention was made to have given the timing resolution factor greater weight than other factors when adapting the detector disclosed by Van Loef to conventional a TOF PET detector as disclosed by Young.

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9. Third, applicant argues that the Young reference does not disclose recording the precise time difference between the gamma rays, however none of the claims explicitly requires this limitation.

10. Fourth, applicant argues that the combination of the Van Loef and Young references are not adaptable for TOF PET measurements. However, again, claims 1-2 refer only to PET detection generally and no specific limitation to TOF PET. Claim 3 discloses a PET detector that has a TOF processor, thus supporting the examiner's assertion that the TOF PET is a particular type of PET which is constructed by adapting the general PET for TOF PET applications.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Sung whose telephone number is 571-272-2448. The examiner can normally be reached on Monday- Friday 9-5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christine Sung
Examiner
Art Unit 2884

CS



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